

What is claimed is:

1. A vacuum shoe for use in a rotatable pneumatic apparatus for retrieving an item at a pickup point, wherein the pneumatic apparatus comprises:

an inner cylinder having an outer periphery with a least one cutout region formed therein, the inner cylinder further having an air passageway communicating with said at least one cutout region and with an air pressure device so as to provide a negative pressure to said at least one cutout region; and

an outer cylinder concentrically mounted on the outer periphery of the inner cylinder for rotation, wherein the outer cylinder comprises at least one opening communicable with said at least one cutout region when said at least one opening is adjacent the pickup point while the outer cylinder is rotated relative to the inner cylinder, said vacuum shoe comprising:

securing means for removably mounting the vacuum shoe on an outer surface of the outer cylinder; and

at least one aperture communicable with said at least one opening, such that when said at least one opening of the outer cylinder is adjacent the pickup point, the negative pressure at the aperture causes said item to become attached to the vacuum shoe, allowing the pneumatic apparatus to move said item away from the pickup point.

2. A rotatable pneumatic apparatus for retrieving an item at a pickup point, said pneumatic apparatus comprising:

an inner cylinder having an outer periphery with a least one cutout region formed therein, the inner cylinder further having an air passageway communicating with said at least one cutout region and with an air pressure device so as to provide a negative pressure to said at least one cutout region;

an outer cylinder concentrically mounted on the outer periphery of the inner cylinder for rotation, wherein the outer cylinder comprises at least one opening

communicable with said at least one cutout region of the inner cylinder when said at least one opening is adjacent the pickup point while the outer cylinder is rotated relative to the inner cylinder;

a vacuum shoe positioned on an outer surface of the outer cylinder, the vacuum shoe having at least one aperture communicable with said at least one opening of the outer cylinder, such that when said at least one opening of the outer cylinder is adjacent the pickup point, the negative pressure at the aperture causes said item to become attached to the vacuum shoe, allowing the pneumatic apparatus to move said item away from the pickup point; and

means for removably securing the vacuum shoe to the outer cylinder, allowing the vacuum shoe to be removed from the pneumatic apparatus for maintenance or replacement.

3. The rotatable pneumatic apparatus of claim 2, wherein the inner cylinder is rotated independently of the outer cylinder such that when said at least one opening of the outer cylinder is rotated to a releasing point, said at least one cutout region of the inner cylinder becomes off-aligned with said at least one opening for reducing the negative pressure at the aperture of the vacuum shoe so as to allow said item to be released from the vacuum shoe at the releasing point.

4. The rotatable pneumatic apparatus of claim 3, wherein the outer cylinder is rotated along one direction, and the inner cylinder is rotated alternatively along the same direction and along an opposite direction in an oscillating motion such that said at least one cutout region of the inner cylinder alternately becomes aligned with said at least one opening of the outer cylinder for providing the negative pressure at the aperture of the vacuum shoe, and becomes off-aligned with the said at least one opening of the outer cylinder for reducing the negative pressure at the aperture of the vacuum shoe.

5. An envelope feeder for feeding envelopes at a pickup point, comprising:
a deck for supporting a stack of the envelopes;
a rotatable pneumatic feeding head for retrieving one envelope at a time from the stack, wherein the feeding head comprises:

an inner cylinder having an outer periphery with a least one cutout region formed therein, the inner cylinder further having an air passageway communicating with said at least one cutout region and with an air pressure device so as to provide a negative pressure to said at least one cutout region;

an outer cylinder concentrically mounted on the outer periphery of the inner cylinder for rotation, wherein the outer cylinder comprises at least one opening communicable with said at least one cutout region when said at least one opening is adjacent the pickup point while the outer cylinder is rotated relative to the inner cylinder;

a vacuum shoe positioned on an outer surface of the outer cylinder, the vacuum shoe having at least one aperture communicable with said at least one opening of the outer cylinder, such that when said at least one opening of the outer cylinder is adjacent the pickup point, the negative pressure at the aperture causes said envelope to become attached to the vacuum shoe, allowing the pneumatic apparatus to move said envelope away from the pickup point; and

means for removably securing the vacuum shoe to the outer cylinder, allowing the vacuum shoe to be removed from the pneumatic apparatus for maintenance or replacement, and

means, operatively connected to the feeding head, for rotating the outer cylinder relative to the inner cylinder.

6. The envelope feeder of claim 5, wherein the inner cylinder is rotated independently of the outer cylinder such that when said at least one opening of the outer

cylinder is rotated to a releasing point, said at least one cutout region of the inner cylinder becomes off-aligned with said at least one opening for reducing the negative pressure at the aperture of the vacuum shoe so as to allow said envelope to be released from the vacuum shoe at the releasing point.

7. The envelope feeder of claim 6, wherein the outer cylinder is rotated along one direction, and the inner cylinder is rotated alternatively along the same direction and along an opposite direction in an oscillating motion such that said at least one cutout region of the inner cylinder alternately becomes aligned with said at least one opening of the outer cylinder for providing the negative pressure at the aperture of the vacuum shoe, and becomes off-aligned with the said at least one opening of the outer cylinder for reducing the negative pressure at the aperture of the vacuum shoe.
8. The envelope feeder of claim 6, further comprising:
means, located at the releasing point, for moving said envelope from the feeding head as said envelope is released from the vacuum shoe.
9. The envelope feeder of claim 8, wherein the moving means comprising:
a plate located adjacent to the feed head for stripping away said envelope from the vacuum shoe, and
a pair of rollers for further moving said envelope from the releasing point.
10. The envelope feeder of claim 8, wherein motion of the outer cylinder, the inner cylinder, and the means for moving said envelope from the feeding head are independently controllable
11. The envelope feeder of claim 5, wherein the vacuum shoe has a plurality of mounting holes, and the outer cylinder has a plurality of threaded holes, each of the

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threaded holes communicating with a corresponding one of the mounting holes, and wherein the securing means comprises a plurality of bolts for engaging with the threaded holes through the mounting holes of the vacuum shoe.

12. An envelope feeder for feeding envelopes at a pickup point, comprising:
a deck for supporting a stack of the envelopes;
a rotatable pneumatic feeding head for retrieving one envelope at a time from the stack, wherein the feeding head comprises:

an inner cylinder having an outer periphery with a least one cutout region formed therein, the inner cylinder further having an air passageway communicating with said at least one cutout region and with an air pressure device so as to provide a negative pressure to said at least one cutout region;

an outer cylinder concentrically mounted on the outer periphery of the inner cylinder for rotation, wherein the outer cylinder comprises at least one opening communicable with said at least one cutout region when said at least one opening is adjacent the pickup point while the outer cylinder is rotated relative to the inner cylinder, and wherein, when said at least one opening of the outer cylinder is adjacent the pickup point, negative pressure causes said envelope to become attached to the outer cylinder, allowing the pneumatic apparatus to move said envelope away from the pickup point;

means, located at a releasing point, for moving said envelope from the feeding head as said envelope is released from the vacuum shoe.

wherein the inner cylinder is rotated independently of the outer cylinder such that when said at least one opening of the outer cylinder is rotated to the releasing point, said at least one cutout region of the inner cylinder becomes off-aligned with said at least one opening for reducing the negative pressure at the opening so as to allow said envelope to be released at the releasing point;

wherein the outer cylinder is rotated along one direction, and the inner cylinder is rotated alternatively along the same direction and along an opposite direction in an oscillating motion such that said at least one cutout region of the inner cylinder alternately becomes aligned with said at least one opening of the outer cylinder for providing the negative pressure at said at least one opening, and becomes off-aligned with the said at least one opening of the outer cylinder for reducing the negative pressure at the aperture of the vacuum shoe;

and wherein motion of the outer cylinder, the inner cylinder, and the means for moving said envelope from the feeding head are independently controllable.

13. The envelope feeder of claim 12, wherein motion of the outer cylinder, the inner cylinder, and the means for moving said envelope from the feeding head are independently controllable by independent servo motors.

14. The envelope feeder of claim 13, wherein the means for moving said envelope from the feeding head further comprises:

a plate located adjacent to the feed head for stripping away said envelope from the feed head, and

a roller for further moving said envelope from the releasing point.